LBNE Event Reconstruction Working Group

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Working Group Charge

Develop and evaluate performance of algorithms to identify particle interactions and associated tracks in the near and far liquid argon TPC detectors for LBNE.

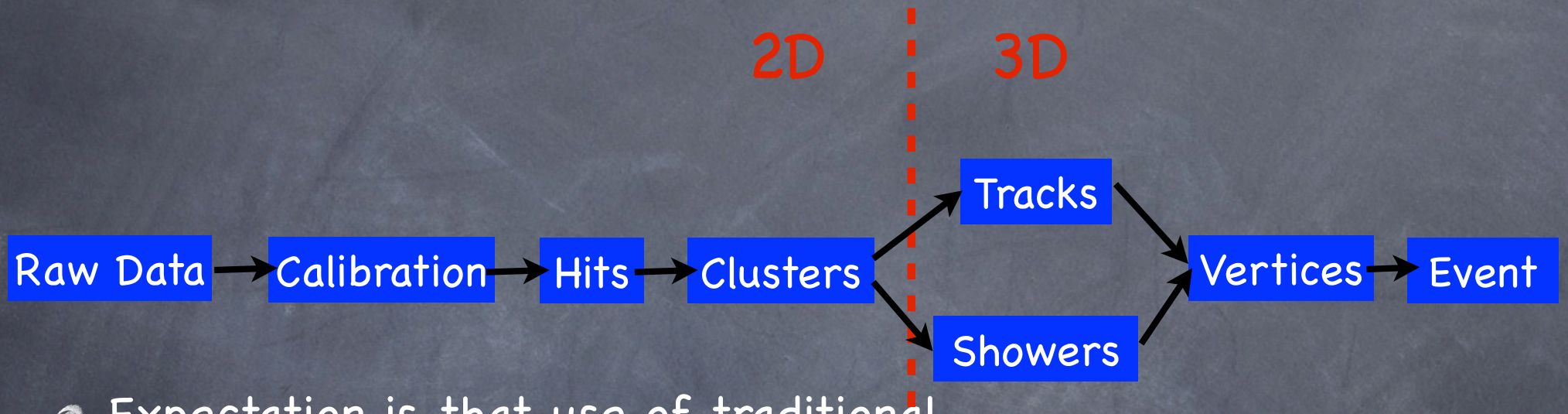
Relationship to LArSoft

- LArSoft is the set of modules in ART (a generic Fermilab-supported framework for simulation and analysis) for liquid argon TPCs.
- LArSoft is designed to support many experiments, and is being developed by members of ArgoNeuT, MicroBooNE, and LBNE.
- LArSoft has its own organizational structure, and the LBNE Reconstruction Group will be an "experiment stakeholder" in that structure.
- LBNE members working on tools of general applicability to liquid argon TPCs will be encouraged to contribute and present their work to the LArSoft working group.
- Not all working group members will need to be part of LArSoft development. Those doing LBNE-specific studies will present their work here.

Working Group Tasks

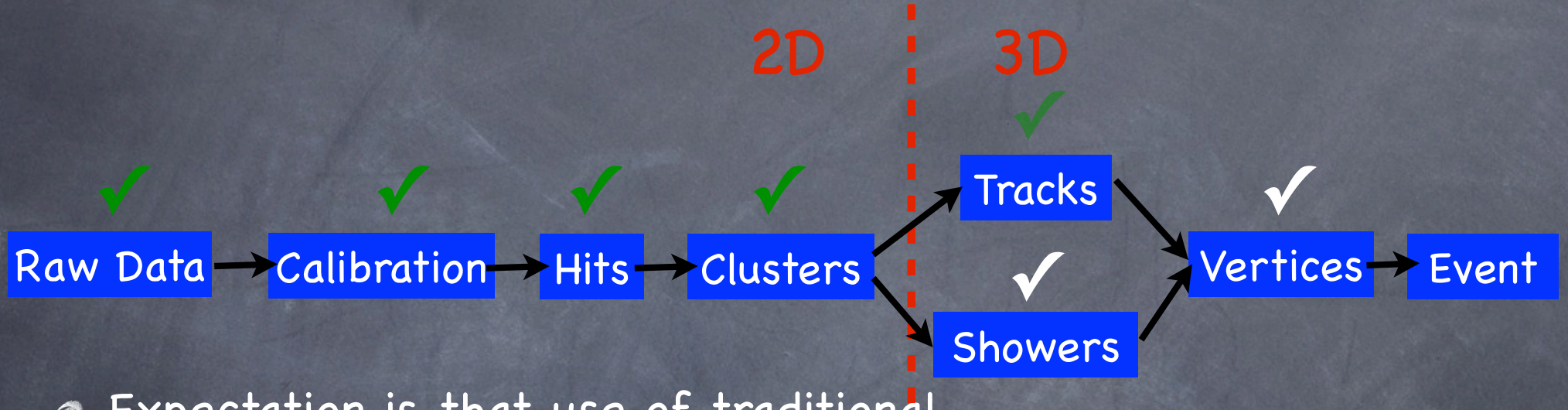
- develop software within the LArSoft framework for hit, track, vertex, and event reco for LBNE
- perform LBNE specific reconstruction and efficiency studies needed for physics working groups sensitivity estimates
- act as the LArSoft/Art stakeholder point of contact for LBNE
- identify and study detector design choices that affect event reconstruction
- maintain LBNE reconstruction validation tools repository and documentation

Event Reco in LArSoft



- Expectation is that use of traditional techniques like Hough transforms, Kalman filters, etc allows common development for ArgoNeut, μBooNE, and LBNE
- Specific design elements for each experiment break symmetry and require development and study

Event Reco in LArSoft



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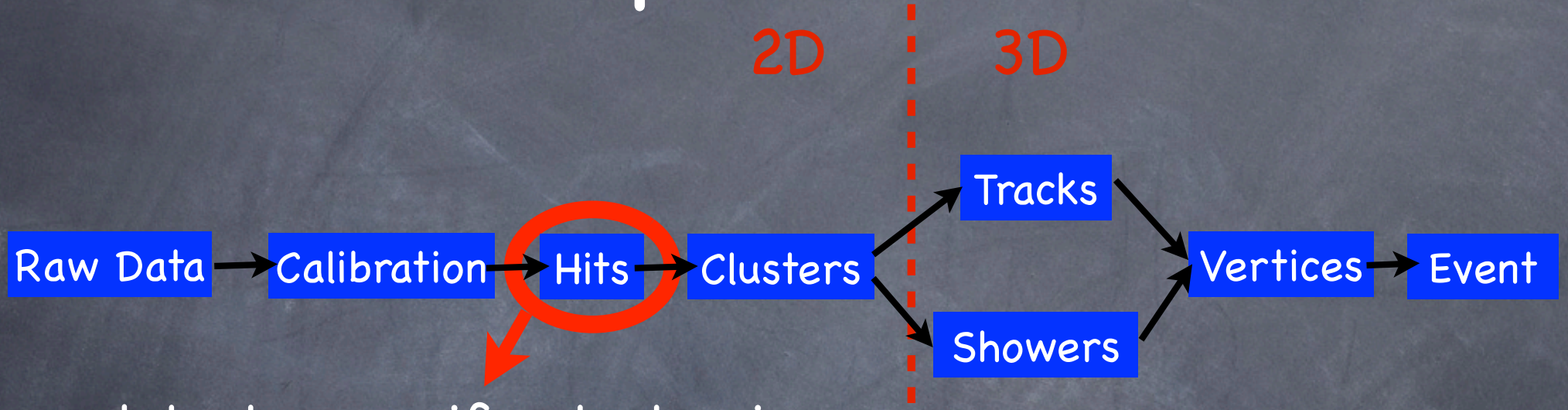
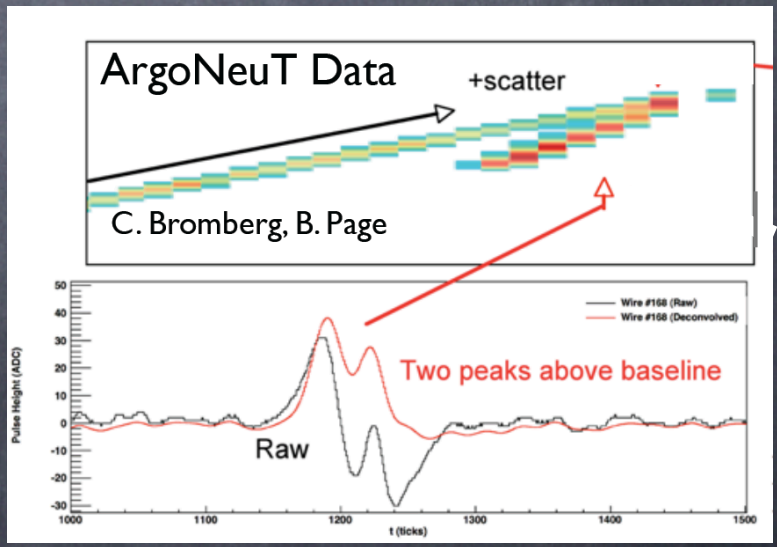
✓ In Use
✓ In Progress

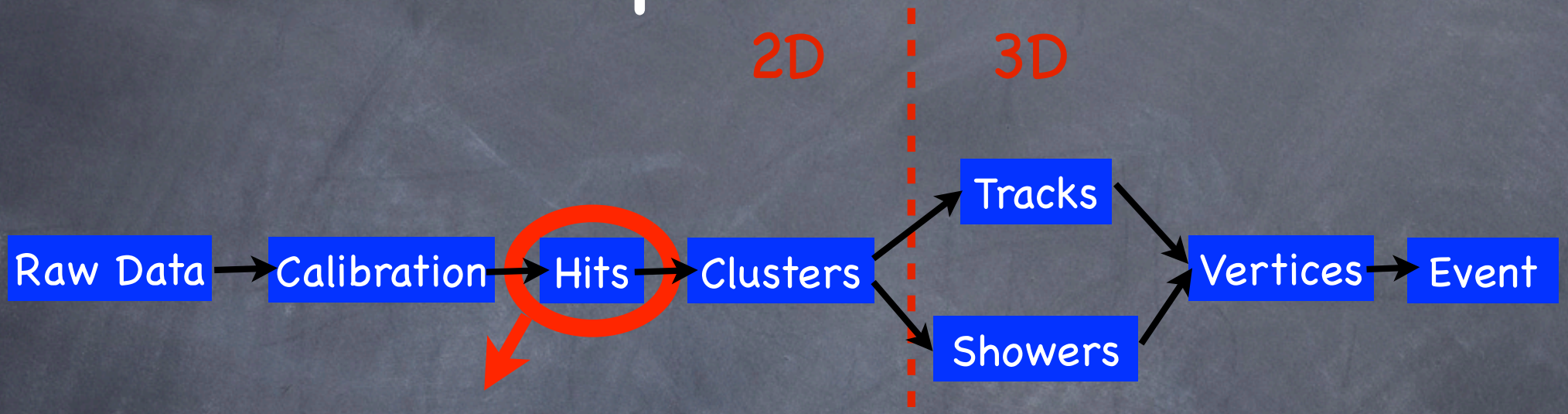
LBNE specific needs



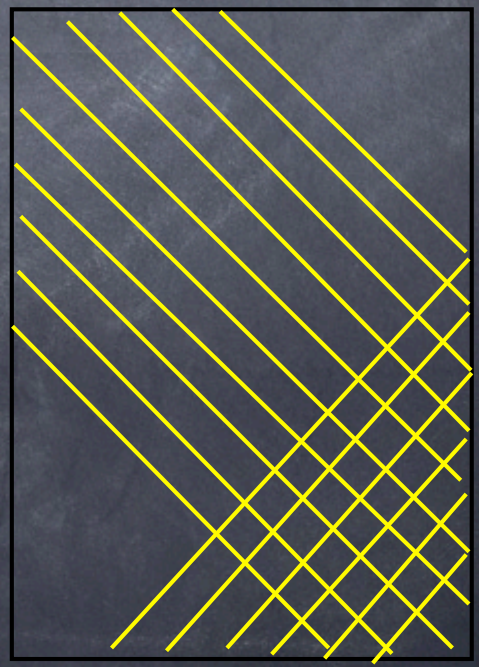
- detector specific electronics affect hit finding algorithm
- current FFTHitFinder senstivite to noise and bandpass
- need to implement model beyond current ArgoNeuT and μBooNE



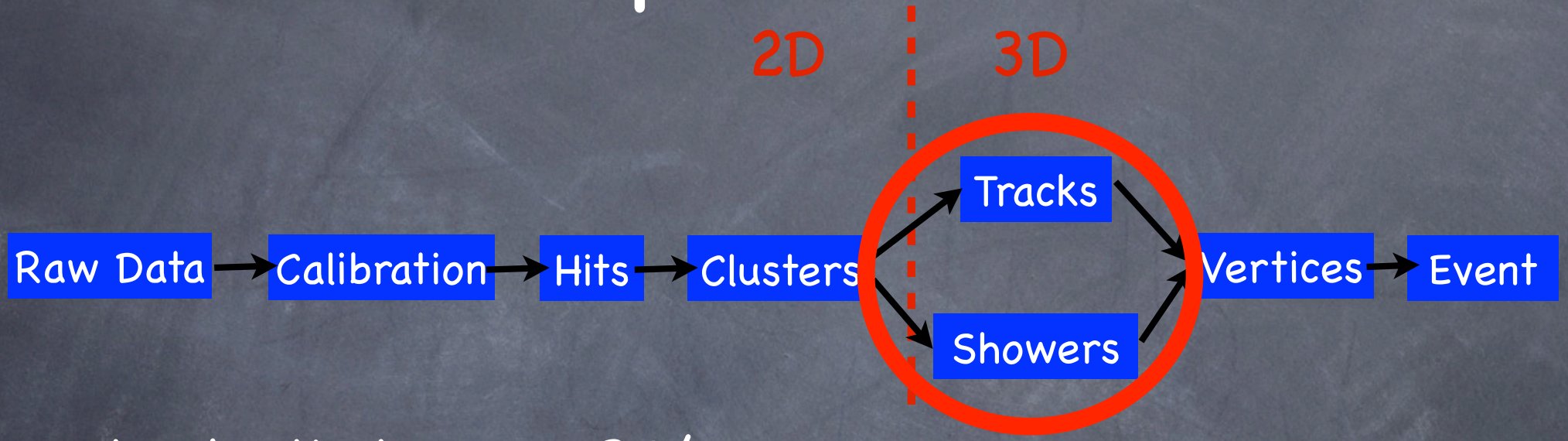
LBNE specific needs



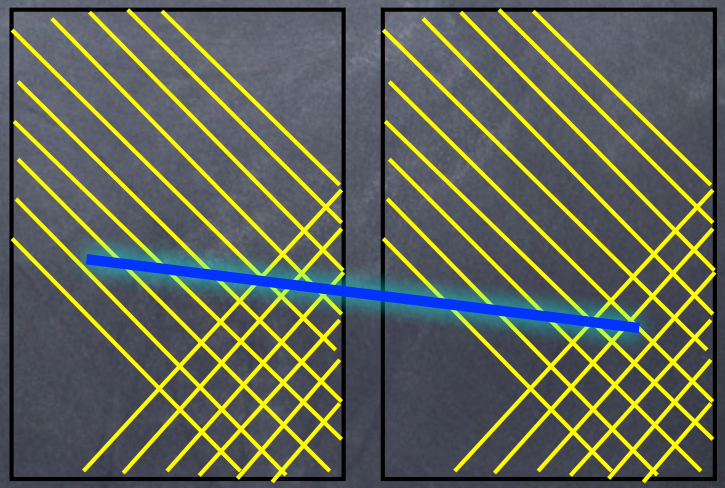
- hit from wrapped wires in anode plane assemblies
- interface with simulation group
- use other detector elements
- dead channel effects



LBNE specific needs



- tracks that cross TPC/cryo module boundary
- understand effect on acceptance and resolution
- calorimetry across TPCs



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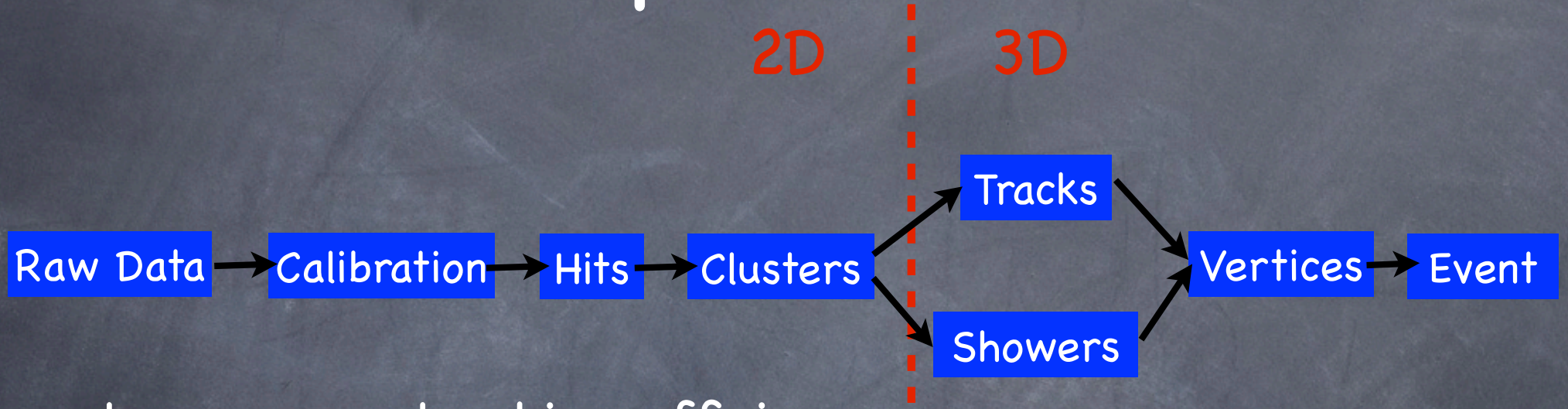

- low energy tracking efficiency and resolution (wire spacing)
- detector occupancy based on overburden (or not)
- proton decay reconstruction tasks

need people to help develop algorithms and strategies

LBNE Reco WG infrastructure

- Beginning to populate RecoWG webpage on the LBNE redmine site
- soon establish SVN repository for LBNE specific reco tools and analysis
- install instructions for Art/LArSoft on home institution machines
- Wiki pages for instructions, suggestions, studies
- issue tracking for requests from physics groups, analyzers, martians, etc

Summary

- LBNE Reconstruction Working group is taking shape and welcoming contributions and ideas
- developing a list of projects and tasks where people can quickly contribute
- goal is to provide the tools needed to do detailed sensitivity studies for LBNE design(s) with full reconstruction
- closely coordinating with the FD simulation group within LBNE and LArSoft group externally
- collective phone meeting every two weeks Wed 10:30 CT

backup slides

why it's better to have fewer meetings